ERIC Document Resume	See Instruction Sheet	DATE OF RESUME	DATE RECEIVED

A. PUBLICATION DATA

1. ERIC NUMBER	2. ORIGINATOR CONTROL NO(S).	3. IDENTIFICATION NO.
ED002561	N.A.	627

DO NOT WRITE IN SPACE BELOW

4. AUTHOR(S): Schramm, Wilbur

MICROFILM COPY AVAILABLE YES ☒ NO ☐

5. TITLE OF DOCUMENT ABSTRACTED: What We Know about Learning from Instructional Television

COPYRIGHT GRANTED YES ☐ NO ☒

COPYRIGHT RELEASE FILED YES ☐ NO ☐

6. PUBLICATION TITLE: N.A.

TYPE OF REPORT
PROPOSAL ☐
IN-PROGRESS ☐
FINAL ☒
FOLLOW-UP ☐

7. EDITOR(S): N.A.

8. PLACE OF ORIGIN
ORG. Institute for Communication Research
ST. Stanford University
CITY, STATE Stanford, California
TELE. EXT.
INST/LOC CODE

9. PUBLISHER OR SOURCE Institute for Communication Research, Stanford University Stanford, California

OTHER ERIC REFERENCES:

10. VOL.	11. PAGES	12. MO./YR.	13. TOTAL PP.
N.A.	N.A.	N.A.	35

ERIC SATELLITE CODE

B. INDEXING DATA

14. SUBJECT AREA

15. TYPE OF ENDEAVOR Report

16. INDEXING TERMS (6-12)

educational television	television research	faculty	class size	
teaching aids	student achievement	teachers	student motivation	
teaching methods	retention	learning	student abilities	
	student attitudes	audiovisual aids		

17. ABSTRACT (MAX. 250 WORDS)

Televised instruction was found to be as effective as classroom instruction when results were measured by final examinations or by standardized tests. Student attitudes toward instructional television were varied; grade school students thought they learned more from televised classes, but high school and college students were doubtful. College students were generally less enthusiastic than high school students. Attitudes of college students depended partially on the subject involved. Most television teachers favored the medium, whereas those who did not teach tended to be suspicious and resistant. Teacher attitudes varied with the subject involved.

When viewing conditions were equally satisfactory, class size had no effect on learning from television. Most studies found no significant differences in retention of subject matter whether the teaching was face-to-face or by television. A novelty effect was present in most of the studies, but it was not always favorable. Such intangible losses through televised teaching as lack of social interaction and lack of concern for individual differences were found, but television students did well in tests of critical thinking, problem-solving, and other nonrote aspects of learning. Research on the relation of forms of televised teaching to learning has reinforced the belief that good teaching is the same on television, film, or the lecture platform.

ERIC No.

18. SOURCE OF ABSTRACT

C. FUNDING DATA

19. SUPPORTING ORGANIZATION	20. DIVISION OR DEPT.	21. CONTRACT NO. / PROJECT NO.
	22. TOTAL COST OF PROJECT	
	23. DURATION OR PROJECT	U.S. Department of Health, Education, and Welfare Office of Education

ERIC Form 1

207-070 O - 66 - 16

627

WHAT WE KNOW ABOUT LEARNING FROM INSTRUCTIONAL TELEVISION

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There can no longer be any doubt that students learn efficiently from instructional television. The fact has been demonstrated now in hundreds of schools, by thousands of students, in every part of the United States and in several other countries. The list of subjects which schools and colleges have been able to teach effectively by television includes:

Arithmetic	Physics	Psychology	Humanities	Reading	Spanish
Algebra	Chemistry	Sociology	Art	Writing	French
Geometry	Biology	Anthropology	Music	Social	German
Calculus	Physiology	Government	Philosophy	Studies	Russian
Accounting	General	History	Literature	Health and	English
Consumer	Science	Economics	Spelling	Safety	Typewriting
Mathematics	Engineering	Electronics	Physical	Driver	Slide Rule
			Education	Education	

Over all this list, the conclusion of testers, school administrators, teachers, and students alike has been that the average student is likely to learn about as much from a television class as from ordinary classroom methods. In some cases he will learn more, and in some less, but over-all the conclusion has been "no significant difference."*

Now that we have approximately 400 scientifically designed and statistically treated comparisons of ITV and classroom teaching, however, it is time to review that verdict. Do the early conclusions stand up under this massive testing? Under what conditions, for what students, and in what areas of subject matter, does instructional television teach best, and in which ones least? What do teachers and students think of classes by television? What does instructional television do to morale and to motivation?

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*See, for example, the two excellent reviews by Kumata (53 and 56 in the list of references appended to this paper), and the insightful article by Carpenter (19). There is also a useful review by Finn (35).

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INSTRUCTIONAL TECHNOLOGY - U.S.C.
ED002561

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education

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How does it interact with mental ability? This is the kind of question which is going to concern us in the following pages.

Much of the research on instructional television is not in the journals. It exists in the form of mimeographed reports. The Ford Foundation, the Fund for the Advancement of Education, the United States Office of Education, and a number of school officials and researchers have made their collections of these reports available to us. As a result, we have been able to assemble 393 cases in which instructional television has been compared with other classroom teaching, 32 cases in which home instruction by television has been compared with classroom teaching, and 14 cases in which military instruction by television has been compared with face-to-face teaching, with what seemed to be adequate design, controls, and statistics. These experiments are not the only ones that have been made, but they are the only ones now available to us. They do not include, for example, any results from the massive Hagerstown project, on which significance figures have not yet been released. But in any case, these represent a much larger sampling of results than has ever before been put together, and on the basis of them we can speak with somewhat more confidence than before about instructional television.

THE BASIC DATA

1. On Learning from Television

The following table sums up the result of the 393 comparisons in schools and colleges. "+TV" means that television was significantly superior (at the .05 level or better) to ordinary classroom teaching; "n.s." means not significant -- no difference between television and face-to-face teaching at the .05 level; and "-TV" means that television was significantly inferior to ordinary classroom teaching at the .05 level or better. Thus the first box of the table should be read: In experiments on teaching mathematics in the 3rd

through 6th grades, television was significantly more effective in 14 cases, there was no significant difference in 21 cases, and in 3 cases television was significantly less effective than was ordinary classroom teaching.

SCHOOL LEVEL		MATH.	SCIENCE	SOCIAL STUDIES	HUMANITIES HISTORY LIT., ARTS	LANGUAGE SKILLS	HEALTH, SAFETY	TOTAL	
3rd-6th Grades	+TV	14	8	12	0	14	2	50	+TV
	n.s.	21	14	11	0	36	4	86	n.s.
	-TV	3	1	1	0	10	1	16	-TV
7th-9th Grades	+TV	4	9	0	2	0	3	18	+TV
	n.s.	11	8	1	7	0	1	28	n.s.
	-TV	2	3	0	0	0	0	5	-TV
10-12th Grades	+TV	0	3	3	4	1	1	12	+TV
	n.s.	10	7	17	17	6	0	57	n.s.
	-TV	5	3	0	9	4	0	21	-TV
College	+TV	0	1	1	0	0	1	3	+TV
	n.s.	4	26	24	11	12	7	84	n.s.
	-TV	0	1	4	3	1	4	13	-TV
TOTAL	+TV	18	21	16	6	15	7	83	+TV
	n.s.	46	55	53	35	54	12	255	n.s.
	-TV	10	8	5	12	15	5	55	-TV
								TOTAL =	393*

This table tells us that the early conclusions do stand up. Instructional television is at least as effective as ordinary classroom instruction, when the results are measured by the usual final examinations or by standardized tests made by testing bureaus. This begs the question of whether the "intangibles" of televised teaching are as beneficial as those of ordinary classroom teaching, and this is a question which we must consider before we come to the end of this report. But employing the usual tests that schools use to measure the progress of their students, we can say with considerable

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*3rd-6th grades different from 10th-12th, p = .001. 7th-9th different from 10th-12th, .01. 3rd-9th different from 10th-college, .001. Both 3rd-6th and 7th-9th different from college, .001. Science different from humanities, .01. Social studies different from humanities, .05.

confidence that in 65 per cent of a very large number of comparisons, between televised and classroom teaching, there is no significant difference. In 21 per cent, students learned significantly more, in 14 per cent, they learned significantly less, from television.

It is clear that televised instruction has been used with greater success in the grades than in high school or college. This can be illustrated by figures derived from the preceding table:

	TV More Effective	No Significant Difference	TV Less Effective	N
Grades 3-9	33%	56%	11%	203
High School	13	63	24	90
College	3	84	13	100

The results for grades 2 through 9 are significantly different from those for high school and for college, as are also the differences for grades 3-6 and grades 7-9 taken separately.

Turning again to the large table, we can see that some subject matter areas have apparently been taught by television more effectively than others. Mathematics and science, for example, have been outstandingly successful, and so have social studies. History, humanities, and literature have been less successful. Language skills and health and safety have been in the middle -- neither so successful as the most effective subjects nor so ineffective as the humanities group. Many of these numbers are too small to show up on tests of significance, but nevertheless both science and social studies are significantly different from the humanities group. Other differences must be considered only trends, although highly indicative and suggestive.

In several cases, there appear to be interactions of importance between subject matter and grade level. Televised language skills have been somewhat

less effective than other televised subjects at the early elementary school level, although still over-all as effective as classroom teaching. Mathematics has been more effectively taught by television in the early grades than in high school. Televised social studies have been somewhat less effective in college, and the humanities group also appears to have been taught less effectively on television at the higher grade levels.

Thanks to the Chicago City Junior College study (32) and the San Francisco State College study (28) we are able to make some comparisons of televised instruction for students at home versus ordinary classroom teaching. The 32 such comparisons now available to us, all on the college level, may be tabulated as follows:

	MATH.	SCIENCE	SOCIAL STUDIES	HUMANITIES	LANGUAGE SKILLS	TOTAL
+TV	1	4	2	1	2	10
n.s.	2	4	8	1	6	21
-TV	0	1	0	0	0	1
					TOTAL	32

It must be remembered that these home students are, in large part, adults who have been unable to finish their college education because they are home-bound. They are consequently highly motivated, and grateful for their opportunity to study by television. When the home TV students are compared with students taught by television in the classroom, they have almost always done better. However, the unusually high motivation of the home students, and the rather negative attitudes of the classroom TV students (who were assigned to an experimental section and deprived of the personal contact which other resident students had with the instructor) lead us to discount these latter comparisons, and not to record them here.

There are also a number of studies of television in military training.

We have at hand 14 experimental comparisons of television vs. face-to-face teaching of military trainees. In 6 of these, the groups taught by television learned significantly more; in 4 cases, there was no significant difference, and in 4 the television group learned less.

THE BASIC DATA

2. Student Attitudes toward Instructional Television

Students in grade school typically think they learn more from televised classes, whereas high school and college students are more doubtful. When students in various school systems were asked, "Do you think students learn more, the same, or less from a TV class?" they answered as follows:

	FLORIDA ELEM.	N.CAROLINA ELEM.	NEBRASKA HIGH SCHOOL	CINCINNATI HIGH SCHOOL	KANSAS CITY HIGH SCHOOL	FLORIDA HIGH SCHOOL
N =	(670)	(533)	(254)	(277)	(300)	(2014)
More	72%	77%	25%	30%	57%	31%
Same	22	13	35	37	31	40
Less	6	10	30	33	12	29

This question was not often asked in the same way in college experiments, and therefore the results cannot be compared exactly. However, the general attitudes of college students toward ITV are, if anything, less favorable than those of high school students. Students of psychology and chemistry at Penn State (18) rated the amount of learning about the same for televised and classroom instruction, but students in non-TV class rated psychology as a subject somewhat higher than did TV students. At Miami University only 2 attitude comparisons in 10 were favorable to TV (59), and only one of those was significant; whereas 3 comparisons were significant in the direction of classroom teaching. Seven out of the 10 responses became less favorable to TV as the course progressed. In a Purdue calculus class the attitude toward ITV worsened as the course went on (29). San Francisco State and the Chicago

Junior College (32, 28) both found that the students they assigned to classroom TV were more negative toward the course than were ordinary classroom students, and more negative toward teaching by television than were students who viewed the class at home.

There is a great deal of material on the morale and attitudes of TV students which we cannot refer to here, except by saying that, in general, elementary school children are enthusiastic over television classes, high school students are much less so, and college students are equivocal or even in some cases unfavorable. If now we add home TV students (who are, for the most part, adults taking a course by television that they could not take in residence) we have a U-shaped distribution of attitudes: The attitudes of grade school children, at one end, and adult home students, on the other, very favorable; the attitudes of high school and college students in the lower parts of the U.

We do not mean to say, however, that there is a simple relationship between age or grade level and attitude. Rather, there is considerable evidence that attitudes tend to be specific to subjects and teachers.

For example, in Jefferson County, Kentucky, almost 100 per cent of the children preferred the televised science class to the regular class, but less than half preferred the televised social studies (50). A very large sample of Southwestern Indiana high school students (82) gave these judgments on four of their televised classes:

	LIKE TV CLASS	THINK THEY LEARN MORE FROM IT	N
Government and Socio-Economics	66.0%	60.3%	1016
U.S. History	58.8	52.0	1866
Geometry	37.1	24.5	207
Junior High Science	72.1	69.3	3805

Norfolk students reported that they liked televised science more, televised geometry less, than regular classes (66, 67).

Two hundred sixty-seven Nebraska high school students gave the following judgments on six of their classes (64, 65):

	Learned more			Enjoyed more		
	From TV	No difference	From classroom	TV	No difference	Classroom
Algebra		x				x
Geometry		x				x
English	x				x	
Art	x			x		
Physics	x				x	
Spanish			x			x

It is worthy of note in this table that enjoyment apparently goes along with learning.

Attitudes of college students toward ITV are also specific to subject matter. Students in five Oregon colleges and universities (82) felt that their televised chemistry course was in general better than classroom teaching in stimulating their learning, but that a course in literature was about the same in that respect as classroom teaching, and a course in English composition was if anything less effective than classroom teaching. Students in Chicago (32) expressed themselves as being more willing to take their Physical Science course by TV than their Social Science, and more willing to take Social Science than Humanities by TV. At New York University (52) students in two classes were asked during the first and during the second semester whether they preferred the TV section or an ordinary lecture section. These were the responses:

	ENGLISH		CULTURAL HERITAGE	
	1st sem.	2nd sem.	1st sem.	2nd sem.
Preferred TV section	31%	20%	51%	78%
Preferred non-TV	69	80	49	22

Thus the stock of the composition course went down, while that of the cultural history course went up. At San Francisco State (28) both classroom TV and home TV students were asked whether they preferred TV or non-TV sections of three courses. Home students were more favorable to TV. Psychology was most favorably rated among the three courses. The responses:

	N	Dislike TV Much	Prefer Classroom	TV Satis-factory	Prefer TV	Enthusiastic over TV
Psychology						
Campus TV	37	16 %	43 %	32 %	3 %	5 %
At-home TV	50	8	18	34	24	16
Economics						
Campus TV	33	39	36	15	6	3
At-home TV	41	12	46	32	2	2
Basic Communication						
Campus TV	24	12	71	17	0	0
At-home TV	29	10	17	52	10	10

In addition to the U-shaped curve of attitudes by age, then, we have a linear trend which might be described as being more favorable to subjects where demonstrations are important (for example, natural science and art), less favorable toward subjects where student-teacher interaction and classroom discussion and drill are important (English Composition and Social Studies). We shall have more to say about these two trends. But even these do not fully describe the pattern of student attitudes toward ITV. Even the location of seats in a large classroom may directly relate to attitudes, as Penn State found (18) when it plotted the seat assignments of students who asked to be transferred out of the TV course. And in a number of colleges and high schools, surprising differences in attitudes have appeared in different sections of the same televised course, differences that appeared only to relate to the classroom teachers. In other words, it appears that a large number of non-TV elements enter into the making of attitudes toward televised instruction.

The continuing measurements of student attitudes at Penn State are especially interesting because the television program there has now been under way for seven years. During the early years of that period, Carpenter and Greenhill report (18, 41) there was "a gradual average change to a somewhat higher level of acceptance." Furthermore, "students appear to be discriminating more clearly than formerly between televised presentations and other more central factors in their instruction. For example, the quality and characteristics of the instructor, the quality of the presentation and the significance of the course material..." Television "as such" ceases to be very important; it is merely another instrument, like a telephone or a slide projector; it is a standard way of teaching, and the important questions are who teaches, what does he teach, and how. When the novelty wears off as it has at Penn State, if TV courses gain the reputation that they offer the best instruction a college can provide in a given subject, then there will be no question, the Penn State people believe, about their acceptance by serious students.

THE BASIC DATA

3. Teacher Attitudes toward Instructional Television

Most teachers who teach on television come to like it. Those who do not teach tend to be suspicious and resistant. This opposition usually is short-lived in the case of elementary teachers, most of whom come to like and depend on television as one part of their teaching resource. In Hagerstown, where perhaps the most extensive experiment in closed-circuit ITV has been conducted, teachers were asked whether they would prefer to teach the class they are now teaching with or without the aid of television; 83 per cent said they preferred to do it <u>with</u> television (42). High school teachers seem to be, on the average, a bit less favorable and more resistant, but among

Detroit teachers, 68 per cent reported that their attitudes toward television had become more favorable since they have had some experience using it in the classroom (26). And country-wide among elementary and high school teachers and administrators there has been a generally favorable evaluation of ITV, as the following tabulation indicates. In six school systems teachers and administrators were asked whether they believed students learned more, the same, or less from televised instruction as compared to ordinary classroom instruction:

	Teachers:					Principals:		
	WEST FLORIDA	WICHITA	MILWAUKEE	MIAMI	ANAHEIM	MILWAUKEE	NORTH CAROLINA	ANAHEIM
N =	(45)	(33)	(51)	(82)	(93)	(9)	(163)	(101)
Believe Students Learn MORE	56%	48%	40%	45%	54%	33%	59%	87%
SAME	33	16	47	48	37	56	37	13
LESS	11	36	13	7	9	14	4	0

The real center of teacher resistance to instructional television is in the colleges. Researchers studying the Oregon System of Higher Education (83) found "considerable resistance by individual professors." The Dean of the College of Liberal Arts at the State University of Iowa reported, after a survey, that his faculty was unfavorable to any extensive use of TV in teaching (84). The events at Compton College show that when television is introduced without adequate preparation and faculty support, this resistance may become explosive.

But if the following figures from Penn State are representative, then college faculties also tend to become more favorable toward ITV. These are responses to a question asked Penn State teachers on the quality of TV instruction as compared to regular classroom teaching (17):

	1955-1956	1956-1957
N =	(48)	(55)
TV Better	10%	22%
TV Same	33	38
TV Worse	52	38
No Answer	3	0
Don't Know	2	2

And even in the Oregon system where "considerable resistance" was found, faculty attitudes were more favorable than unfavorable:

	OREGON COLLEGE OF EDUC.	OREGON STATE COLLEGE	UNIVERSITY OF OREGON	WILLAMETTE UNIVERSITY
N =	(28)	(171)	(123)	(26)
Excellent approach to teaching; should have extensive use	7%	17%	14%	0%
Pretty good approach; should have some use	68	45	44	42
Haven't made up my mind	11	16	19	15
Rather poor approach; should be used in limited situations	14	18	19	31
Should not be used for instruction	0	2	2	12
No answer	0	2	2	0

Teachers discriminate sharply among TV courses. Asked to compare the progress their TV classes were making as compared to the previous non-TV classes, a sample of Dade County, Florida elementary school teachers answered as follows (23, 24):

	More Progesss	Same	Less	N
Science	67%	25%	8%	52
Music	23	52	25	48
Art	25	44	31	52
Physical Education	52	43	5	48
Spanish	26	53	21	47
Health and Safety	50	43	7	48

Asked which telecasts were most valuable to them, a large group of Anaheim, California teachers and principals voted the Science and Social Studies classes most helpful, the Spanish class only slightly less helpful, and the Arithmetic telecast of comparatively little help (1). A sample of 1,191 Milwaukee elementary teachers and principals (62) gave the following judgments as to which telecasts they wanted as resources:

	Primary Teachers	Intermediate	Upper	Principals
Art	71%	62%	69%	59%
Science	67	74	53	80
Arithmetic	18	9	10	27
Reading	18	12	18	24
Language Arts	16	15	17	21
Social Studies	32	33	26	49
Music	50	33	38	47
Physical Education	54	43	22	53
Foreign Language	12	23	16	34
Handwriting	12	13	6	30
Spelling	6	4	2	16

The most favored courses seem to be the ones that can bring useful demonstrations (science) or in which the teacher needs special help (physical education, music, art); the least favored courses are those that are built around classroom drill (reading, writing, spelling, arithmetic).

There is no comparable report of college teachers' preferences over a broad range of televised courses.

THE CHIEF QUESTIONS

Beyond the basic problems of learning and attitudes, several questions are asked oftener than others about instructional television. Among these are:

1. Is There Any Kind of Student Who Profits More than Other Kinds from Instructional Television?

A bright student learns more than a slow student, a motivated student

more than an unmotivated one, in almost any learning situation. But given equally bright, or equally motivated students, is there any level of ability or motivation at which learning by television is markedly superior or inferior?

On these problems the data are muddy. Here, for example, is at least a partial tabulation of the studies of mental ability as related to instructional television:

Fritz, 1952. Military subjects at Fort Monmouth. Divided radio electronics students into high and low aptitude groups. Some of each group were taught by TV. Found no significant difference in scores of TV and non-TV groups when equated for ability (37).

Kanner, et al., 1954. Split both TV and non-TV groups of basic trainees at Camp Gordon into high and low aptitude groups. N.s.d. in high group, but 10 of 17 tests in low group favored TV; other 7 tests n.s.d. (48).

Williams, 1954. Taught four groups of students at University of Toronto by TV, radio, lecture and reading assignments, respectively. TV higher than lecture in high and low ability groups, but equal in average group (97).

Kumata, 1958. Michigan State University students. Unable to reproduce Kanner's finding of superiority of TV instruction for low ability students (54).

Seibert, 1958. Purdue University students in English composition. Found that low ability TV students compared less favorably with control group than did high ability TV students (79).

Seibert, 1958. Purdue University students in Freshman Mathematics. No important interactions between mental ability and method of instruction (80)

Macomber and Siegel, 1960. Miami University students in Educational Psychology, Economics, Physiology, Zoology, and Government. Breaking both TV and control groups by quartiles on mental ability, they found 1 significant difference out of 4 in top quartile -- this in favor of TV group. In bottom quartile, found 2 significant differences out of 4 in favor of TV, 1 in favor of control. Breaking the groups by halves on mental ability, they found no significant differences out of 10 in the upper, 2 significant differences out of 10 in the lower half. Both these were in favor of the control group (59).

When the research evidence is as unclear as this, observations by experienced teachers may be as valuable as a research study. But these observations, too, are far from unanimous. Milwaukee teachers voted nearly 5 to 1 that TV was better for the fast than the slow learners. Anaheim teachers and principals, asked which ability group benefits most from televised instruction, responded as follows:

	Teachers	Principals
Fast Learners	17%	0%
Average Learners	28	38
Slow Learners	31	25
No Difference	24	38

A group of 226 North Carolina teachers were asked whether ITV or classroom instruction was better for the different ability groups, and responded thus:

	TV better	No difference	Non-TV better
Superior students	93%	2%	5%
Average students	79	8	13
Slow learners	73	9	18

It may well be, as some recent and unpublished research suggests, that both the brightest and the slowest students may derive some differential benefit from televised teaching -- the former, because they learn rapidly anyway, and television can theoretically offer them a great number and variety of responses to learn; the latter, because television concentrates their attention as the classroom often does not. But it must be admitted that we do not yet understand the relation of mental ability to differential learning from television.

It is the general feeling of most persons who have taught or done research in connection with instructional television that motivation is closely related to the results they have obtained. Erickson and Chausow, for example, thought

that lack of motivation probably explained the lower results of students who were assigned to television sections, just as high motivation explained the very good results obtained in teaching home students by television (32). But the results have been equivocal in cases where the motivation has been measured and controlled. For example, when Mullin motivated some 11th graders (not others) by offering a monetary reward for a high examination score, he found that the motivated students learned more than the others from a televised program on education, and concluded that the classroom was probably a better place than the TV room for unmotivated students. This seems to make sense, in that the classroom teacher may well be better able to take care of individual problems and thus raise motivation. But when Dreher and Beatty (28) measured need-achievement in their TV and classroom students, they could find no significant difference in the amount of learning by television or classroom groups among the high or the low achievers.

No significant results have yet turned up in the literature to suggest that any other common personality traits make for greater or less learning from televised instruction as compared to classroom teaching.

THE CHIEF QUESTIONS

2. Does Size of Class Make Any Difference in Learning from Instructional Television?

Students generally prefer to be in small rather than in large classes, but no differential effect of class size on learning from ITV has been reported in cases where viewing conditions were equally satisfactory. Penn State (16) varied the size of television classes between 19 and 120 students without producing differential results in learning.

THE CHIEF QUESTIONS

3. Does Televised Teaching Make Any Difference in Retention of Subject Matter over a Long Period?

One study of military training (48) found that television students remembered more of the subject matter one month later. Another military study (13), and five civilian studies (11, 17, 55, 72, 80) found no significant differences.

THE CHIEF QUESTIONS

4. Is There a Novelty Effect in the Reported Results?

It may be taken for granted that there is. In some cases, it can be isolated. For example, an early military study (1952) found that trainees preferred to study from, and learned more from, lessons which they thought were kinescopes (television recordings) than from films -- even though the "films" were identical to, or poorer in quality than, the kinescopes. Several years later (1955), the finding could not be repeated (76). It was assumed, therefore, that the novelty effect of television teaching had worn off.

A number of the studies in school systems and colleges, however, have records of three or more years of experimentation with instructional television, during which time their students have in many cases taken a number of courses by television. Yet there seems to be no downward curve of achievement in these studies. Many observers feel that the growth in skill at using television counterbalances the loss of novelty effect.

It must be remembered, also, that the novelty effect is not always favorable. Many college students have not welcomed the opportunity to study by television when they have first been offered it. Many students have been made self-conscious and resistant, rather than achievement-minded, when researchers have paid more attention to them.

Although we cannot rule out the novelty or the Hawthorne effect, still there is little evidence to indicate that these might be giving us, over-all, spuriously high scores from ITV classes.

THE CHIEF QUESTIONS

5. Are We Measuring the "Intangibles?"

The more "intangible" they are, the less likely it is that they are being measured. Yet the question is important, and must be faced seriously.

The intangible qualities which people most often talk about in connection with supposed lacks in televised teaching are those related to social interaction. It is contended that instructional television substitutes for direct personal contacts, for the give and take of discussion and recital, a passive relationship of the student to a televised image. Students of television now tend to believe that the viewer is much less passive than formerly thought, but the rest of the statement is manifestly true: television cuts down on interaction within the classroom. What effect does it have? In the San Francisco study (28) there is evidence that students in television classes knew fewer of their classmates than students in non-televised classes. In the lower grades, where pupils are together all day, and television absorbs only a minor part of the time, this result would not be expected. There is no evidence to indicate that reduced interaction in the classroom has any harmful effect on children's personalities, or on their social skills, although this is conceivable. Milwaukee teachers rejected overwhelmingly the suggestion that the TV classroom is "cold, or lacking in human warmth" (62).

The other set of "intangibles" most often mentioned are those related to individual differences. It is contended that one of the functions of education is to help a child solve some of his own problems. These may be solved

either by personal counselling by the teacher or another official, or by skills and insights derived from the classroom. The skills may be measured, but the outcomes are not. Therefore, an important set of outcomes may not be represented in ordinary measurements of learning. These contentions are manifestly true, and to the extent that television makes it harder for the student to get individual counselling or to assemble his learning around his personal needs, then there may indeed be some intangible loss. The question is whether, in a well-planned learning experience, of which television is a part, there need be any less opportunity for a student to solve his personal problems.

The research has so far been unable to locate any other intangible losses resulting from instruction by television. There has been some attempt to find out whether televised teaching -- because it presents an "authority" rather than inviting democratic discussion -- might develop authoritarian personalities in students. Carpenter and Greenhill (18) found no evidence to confirm this. The same researchers, however, found that a group of students taught by the discussion group method scored higher on a test of problem-solving than did a comparable group taught by television. In general, however, television students have held their own in tests of critical thinking, problem-solving and other non-rote aspects of learning.

THE CHIEF QUESTIONS

6. What Do We Know about the Relation of Forms of Televised Teaching to Learning?

There is a great deal of research on the forms of effective teaching from film*, and much of this is undoubtedly applicable. The amount of such

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*For example, see May, M. A., and Lumsdaine, A. A. Learning from Film. New Haven: Yale University, 1958. Also, Hoban, C. A., and Van Ormer, Instructional Film Research, 1918-1950, Port Washington, N.Y.: Special Devices Center, Report SDC 269-7-19, 1950.

research concerning television is growing. However, the net result so far is to reinforce the belief that good teaching is much the same on television or films or the lecture platform.

A student who wants to learn can learn from a great variety of experiences. Williams (97) assigned parallel groups to television, radio, and classroom teaching, and still another group to read in the library and attend no classes at all. All these groups learned, although the television group learned a little more. Stuit and others (85) compared a variety of ways of studying political science: TV lecture, TV discussion, small and large group discussion, and lecture. There was little difference in learning. Brandon (14) compared the same individuals communicating the same material in the form of a lecture, an interview, and a panel discussion, and found no significant differences.

One trend in the literature is toward simplicity of treatment. Although Klapper (52) found that students liked TV teaching better with a number of visuals than when it was straight lecture, Carpenter and Greenhill (18) found that lecture and blackboard alone made for more learning than lecture plus charts, plus models, plus training films, plus visiting speakers, plus dramatizations, and so forth. A replication of this experiment in another class, however, resulted in no significant difference, which is itself a useful finding. The implication is that complexity of presentation, and a great variety of visual cues, may distract a student from the main principles of the presentation. This was tested by Kumata (74) who presented two advertisements, one with visuals in color projected on a large screen, the other with black and white visuals projected on a television-size screen. He found that subjects remembered more details from the colored version, but remembered <u>principles</u> better from the black and white version.

One of the rules held to by television professionals seems not to apply to teaching by television. This is "eye-contact," meaning that the speaker looks the viewer directly in the eye. Westley and Mobius (93) found this made no difference in learning.

WHAT WE KNOW AND MOST NEED TO KNOW ABOUT LEARNING FROM INSTRUCTIONAL TELEVISION

On the basis of this information, what can we say about the process of learning from instructional television?

We can say confidently that students learn from it, and that they learn fast and efficiently. But of that we have been fairly certain for some time. The further step we have now taken has put us in position to say something about the conditions under which a student learns more from television, and something about what he learns from television.

But before turning to those matters, let us consider for a moment the central fact that apparently about as much learning takes place in a television class as in a non-television class. In a sense, this is a remarkable discovery. As Hoban says (43), there is every reason to expect that there should be less learning in a television class. There is an absence of the intellectual give and take believed to characterize some of the most effective teaching. There is little opportunity to adjust to individual differences, rates, and needs. The student can't so readily feed back his responses, or signal his lack of understanding, or clear things up with a question. There is indeed good reason to expect that conditions would make for a less favorable outcome and a less well-informed student.

However, we have seen that 86 per cent of 393 experimental comparisons in life situations have resulted in as much or more learning in a television,

as compared to a conventional, classroom. Why should this be? Is it something in the quality of the teaching, or something in the nature of the process?

One of the significant things about the literature of instructional television is the repeated observation that teachers who are going on television feel the need to put many additional hours into preparation. Some of these teachers are given an entire term free of teaching, or put on special appointment for the summer term, in order to get ready for teaching a television class. Ordinarily, when one teaches a television class, he teaches nothing else: one class. And when a teacher is putting one of his courses on television, a great effort is made with lesson plans, student guide, workbook, visuals, and so forth.

Remember that these teachers are not teaching their television courses for the first time. In many cases, they have taught the subject for years, in the classroom. They have taught it along with half a dozen other subjects. They have never before insisted on a free term to prepare, or trial films to see themselves teach, or a schedule reduced to one course; nor have they made such efforts with outlines and materials. Indeed, they have never had the opportunity to indulge in such relative luxuries.

Regardless of whether the class is televised on open circuit or closed circuit, it puts the teacher's classroom on open circuit. The teaching is on the screen for all the teacher's colleagues to watch. The sanctum of the classroom is opened to critical eyes. And therefore, we are getting better prepared and more skillful teaching on television, and this is doubtless overcoming some of the disadvantages which result from lack of classroom interaction.

But let us look further at those disadvantages. What are the great

weaknesses of television? It doesn't stop to answer questions. It doesn't readily permit class discussion. It can't very efficiently conduct drill. It doesn't adjust very well to individual differences. It tends to encourage a passive form of learning rather than an active seeking.

It also has great strengths. It is very good at bringing demonstrations to the classroom: it lets everyone look through a microscope at the same time, gives all the medical students a good view of surgery, handles films and other changes from straight classroom presentation with a minimum of transitional difficulty. It lets a school or a college share its <u>best</u> teachers, rather than rationing them. It provides a change of pace, often a lift, for the classroom. It brings a sense of timeliness to classes where that helps. It concentrates attention.

These advantages are not small. They help to explain why television has not done so badly in the classroom as many observers expected it would. More important, they help us to understand why certain subject matter areas have been taught more effectively than others. We could predict, for example, that courses which gain from great demonstrations (as science does) would gain from television. One would expect science to gain more from television treatment than, for example, philosophy, which depends largely on clear verbalization. One could predict that subjects like reading, writing, and spelling would not gain much from being televised, because mastery of those skills depends so largely on individual practice. We could predict that social studies, which gain from timely demonstration, would gain more from television than a course in history. This is approximately the pattern we find in the table on page 3.

Clearly there is an interaction between characteristics of subject matter and characteristics of the student and the school at a given grade level.

In grade school, television is still fresh and interesting to children. As a teaching device, it is accepted as simply another instrument from which they can learn -- like the textbook, the film projector, the language laboratory, and the blackboard. They have never gotten used to any kind of instruction that does not include television. They take to it naturally, and seldom think about alternative ways they might be learning.

Things are different when television comes to high school or college students. In general, they are less favorable to education anyway. Education has lost its edge. Many of them are unwilling learners. Furthermore, they have become accustomed to a different kind of teaching. They are used to asking a question when they feel the need to ask one. They have learned to enjoy, many of them, the classroom interaction. In college, many of the students are extremely serious about career goals, and personal contact with a professor is something they feel they are paying for. They tend to regard a television screen as a place to look for entertainment, not a place to study with a professor.

In addition to this, students at the higher levels typically are aware of unfavorable faculty attitudes toward television. The college teacher, in particular, is threatened by the idea of having his classroom opened up to critical eyes. He sometimes regards colleagues who are successful on television as showmen, rather than scholars. These attitudes are communicated to students, and it is not surprising that motivation at the higher levels has sometimes been less than in the early grades or in the case of home students.

There is a difference that is still more important between the meaning of television to the lower grades and to the higher ones and college.

In grade school, television is typically thought of as only a part of

the learning experience, and efforts are taken to integrate it, just as the textbook, the film, the blackboard, the class drill, are integrated. The teacher is with the child five hours a day, and only half an hour or so of that is given over to television teaching. Therefore, the lesson is carefully built around the television experience. Care is taken to motivate the children to want to learn from television, and to ask the teacher the questions they cannot ask television directly. The program is thus prepared for, and followed up, and is accompanied by other learning experiences (such as drill and discussion) which television cannot so readily accomplish.

In other words, it is usually the classroom teacher, rather than the television teacher, who is in command of the situation. The TV teacher is a valued ally and helper. But a teaching team is in operation, the different roles are meshed, and the student still has a teacher of his own to give him personal attention and help him progress in his own best way.

Colleges are much less likely to integrate a television course into a broader course. Whereas in grade school television is usually thought of as a resource, and the classroom teacher is still in command, in college television takes over, and the television teacher is in command. In both high school and college, the administrations are more likely to put a good teacher on the screen and let him give a lecture course.

It is interesting to us that no college has yet used this concept in what seems to be one of its most exciting applications. Recall the pattern of an English university like Oxford or Cambridge. These universities typically offer a limited series of lectures each year, voluntary to students, and supposedly given by the greatest authorities who care to expose their ideas in this way. Some of the students go to a number of lecture series; some go to almost none. The chief activity of the student is to prepare for a

continuing series of intensive tutorial sessions with teachers, to work in laboratories, and to read for a challenging set of examinations. This pattern is one to which television seems almost ideally suited. Why not put the best lectures on television, on a voluntary basis? This would require fewer lectures, and better ones. It would leave more time for individual study and guidance. It would put the emphasis where it seems it ought to be: on active learning by the student.

So far as we know, television has never been employed in that way by an American university, and in many ways it seems an opportunity lost. If the colleges are not going to integrate their television teaching into such a learning plan as the grade schools use, then this voluntary lecture plan seems one of the most promising ways to use it.

One of the keys to understanding the pattern which we have been describing in this paper is the extent to which instructional television is perceived as different and as a threat. It was much more often so perceived when it was very new, and it is more often so perceived now in college than in the grades. The schools which have used it for a few years now tend to take it in stride. They realize that it can do certain things very well and other things not well at all. The attitude studies referred to in the preceding pages are full of teachers' criticisms of the way they themselves were using television. The chief mistake they admit to is the same one, from school to school: not enough "follow-up time." Not enough time to answer the questions, to add the necessary drill and relate the television material to other material, and otherwise integrate it into the package. When there is a "team" in charge of the teaching, when the classroom teacher is centrally concerned with the total learning experience, then this kind of problem usually gets solved. Television comes to seem no more different than other aids to good learning.

Television is not in command as it typically is in college televised teaching. It can be much used or little used, as works best. It can be leaned on heavily for science, and hardly at all for spelling or arithmetic. It is not threatening; it is a friend and aider.

The concept of a teaching team and an arsenal of resources is about to be strengthened by the availability of self-teaching programs and devices. These will aid the teacher in drill and practice, as television aids him by contributing expert lecturing and skillful demonstrations. They will complement television where it is weakest, and leave the teacher freer to take care of individual learning problems, and to help the student combine the various resources open to him.

Neither these self-teaching devices nor television will put the classroom teacher out of business. Indeed, our observation is that the classroom teacher, who wondered if she might be obsolescent when the television teacher appeared, is now really more important than ever. We are encouraged in this belief by reading this statement in the report of the Philadelphia Public Schools:

> "The classroom teacher has emerged as a key entity of the 'teacher team.' Excellent TV lessons are enhanced by skillful handling of pupil questions, lesson extension and application. Pupil learnings and attitudes are determined by the skill, enthusiasm and attitudes of the classroom teacher. TV will not supplant teachers; rather it creates the need for more good teachers." (74)

To the researcher, as well as the educator, this has an implication: that he would do well to shift his sights from the uniqueness of television to the totality of the learning behavior and process. We have no intention of giving advice to educational administrators, but perhaps may be permitted to say a few words to researchers.

It is still of great importance to clear up, if we can, the interaction

of television learning with different levels of ability. It is also clearly of importance to find out more about the "intangibles" which may be differentially learned or not learned from television and which are not measured by the usual end-of-term test. And there are a number of questions of what goes on the screen or on the sound track which need to be cleared up.

But the most important research on instructional television, now, it seems to us, is research on the total process of which television is a part. When Carpenter talks about television research as system research (19), he is, in effect, asking how television fits into the learning experience. How can it be used best, and for what? How can it best be combined with other experiences, to make learning a given subject most efficient? In other words, we are really asking how children most efficiently learn to read, or to spell, or to compute, or to understand the Second Law of Thermodynamics, or to speak French, or to discriminate good literature from bad, or to internalize the goals and values of their nation and their culture. We are not suggesting that nothing is known about those things, merely that much more needs to be known. One of the great things about instructional television, as about self-teaching devices, is that they necessarily focus our attention on the larger process if we are to understand the part they play in it.

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